RD Sharma Solutions for Class-9

RD Sharma solutions for chapter 1

RD Sharma Solutions for Chapter 1 - Number System

Exercise-1.4

1. Solution:

A number which cannot be expressed in the form of $\frac{p}{q}$ where p and q are integers and q ≠ 0 is called an irrational number.

2. Solution:

A rational number can be expressed in either terminating decimal or non-terminating recurring decimals but an irrational number is expressed in non-terminating non-recurring decimals.

3. Solution:

Sol. (*i*) $\sqrt{7}$

It is an irrational as 7 is not a perfect square.

(*ii*) $\sqrt{4}$

It is a rational number as 4 is a perfect square of 2.

(*iii*) $2+\sqrt{3}$

It is an irrational number as sum of a rational number and an irrational number is also an irrational number.

(*iv*) $\sqrt{3}+\sqrt{2}$

Irrational as sum of two irrational numbers is also an irrational number.

(*v*) $\sqrt{3}+\sqrt{5}$ is an irrational number as sum of two irrational numbers is also an irrational.

(*vi*) $(\sqrt{2}-2)^2 = 2+4+2\sqrt{2}\times 2 = 6+4\sqrt{2}$

$\{\because (a-b)^2 = a^2+b^2-2ab)\}$

It is an irrational number as sum of a rational and an irrational number is an irrational number.

(*vii*) $(2-\sqrt{2})(2+\sqrt{2}) = (2)^2 - (\sqrt{2})^2$

$\{\because (a+b)(a-b) = a^2 - b^2\}$

$= 4 - 2 = 2$

Which a rational number

(*viii*) $(\sqrt{2}+\sqrt{3})^2 = 2 + 3 + 2\sqrt{2}\sqrt{3}$

$\{\because (a+b)^2 = a^2 + b^2 + 2ab\}$

$= 5 + 2\sqrt{6}$

Which is an irrational number as sum of a rational and an irrational number is an irrational number.

(*ix*) $\sqrt{5} - 2$ is an irrational number as difference of an irrational number and a rational number is also an irrational number.

(*x*) $\sqrt{23}$ is an irrational number as $\sqrt{23}$ is not a perfect square.

(*xi*) $\sqrt{225} = 15$

Which is a rational number.

(*xii*) 0.3796 is a rational number its decimal is terminating.

(*xiii*) $7.478478..... = 7.\overline{478}$

Which is non-terminating recurring decimal. Therefore it is a rational number.

(*xiv*) 1.101001000100001.....

It is an irrational number as its decimal is non-terminating non-recurring decimal.

4. Solution:

(i) We have,

√4 can be written in the form of

p/q. So, it is a rational number. Its decimal representation is 2.0

(ii). We have,

3 × √18

= 3 × √2 × 3 × 3

= 9×√2

Since, the product of a ratios and an irrational is an irrational number. 9 ×√2 is an irrational.

3 ×√18 is an irrational number.

(iii) We have,

√1.44

= √(144/100)

= 12/10

= 1.2

Every terminating decimal is a rational number, so 1.2 is a rational number.

Its decimal representation is 1.2.

(iv) √(9/27)

We have,

$\sqrt{(9/27)}$

$=3/\sqrt{27}$

$= 1/\sqrt{3}$

Quotient of a rational and an irrational number is irrational numbers so

$1/\sqrt{3}$ is an irrational number.

$\sqrt{(9/27)}$ is an irrational number.

(v) We have,

$-\sqrt{64}$

$= - 8$

$= - (8/1)$

$= - (8/1)$ can be expressed in the form of a/b,

so $- \sqrt{64}$ is a rational number.

Its decimal representation is - 8.0.

(vi) We have,

$\sqrt{100}$

$= 10$ can be expressed in the form of a/b,

So $\sqrt{100}$ is a rational number

Its decimal representation is 10.0.

5. Solution:

(i) We have,

$x^2 = 5$

Taking square root on both the sides, we get

X = √5

√5 is not a perfect square root, so it is an irrational number.

(ii) We have,

$= y^2 = 9$

= 3

= 3/1 can be expressed in the form of a/b, so it a rational number.

(iii) We have,

$z^2 = 0.04$

Taking square root on the both sides, we get

z = 0.2

2/10 can be expressed in the form of a/b, so it is a rational number.

(iv) We have,

$u^2 = 17/4$

Taking square root on both sides, we get,

u = $\sqrt{(17/4)}$

u = $\sqrt{17}/2$

Quotient of an irrational and a rational number is irrational, so u is an Irrational number.

(v) We have,

$v^2 = 3$

Taking square root on both sides, we get,

v = $\sqrt{3}$

$\sqrt{3}$ is not a perfect square root, so v is irrational number.

(vi) We have,

$w^2 = 27$

Taking square root on both the sides, we get,

w = $3\sqrt{3}$

Product of a irrational and an irrational is an irrational number. So w is an irrational number.

(vii) We have,

$t^2 = 0.4$

Taking square root on both sides, we get, t = √(4/10)

t = 2/√10

Since, quotient of a rational and an Irrational number is irrational number. t^2 = 0.4 is an irrational number.

6. Solution:

(i) √2 is an irrational number.

Now, √2 -√2 = 0.

0 is the rational number.

(ii) Let two irrational numbers are 3√2 and √2.

3√2 - √2 = 2√2

5√6 is the rational number.

(iii) √11 is an irrational number.

Now, √11 + (-√11) = 0.

0 is the rational number.

(iv) Let two irrational numbers are 4√6 and √6

4√6 + √6

5√6 is the rational number.

(iv) Let two Irrational numbers are 7√5 and √5

Now, 7√5 × √5

= 7 × 5

= 35 is the rational number.

(v) Let two irrational numbers are √8 and √8.

Now, √8 × √8

8 is the rational number.

(vi) Let two irrational numbers are 4√6 and √6

Now, (4√6)/√6

= 4 is the rational number

(vii) Let two irrational numbers are 3√7 and √7

Now, 3 is the rational number.

(viii) Let two irrational numbers are √8 and √2

Now √2 is an rational number.

7. Solution:

Let a = 0.212112111211112

And, b = 0.232332333233332...

Clearly, a < b because in the second decimal place a has digit 1 and b has digit 3 If we consider rational numbers in which the second decimal place has the digit 2, then they will lie between a and b.

Let. x = 0.22

y = 0.22112211... Then a < x < y < b

Hence, x, and y are required rational numbers.

8. Solution:

Let, a = 0.515115111511115...

And, b = 0.5353353335..

We observe that in the second decimal place a has digit 1 and b has digit 3, therefore, a < b.

So If we consider rational numbers

x = 0.52

y = 0.52062062...

We find that,

a < x < y < b

Hence x and y are required rational numbers.

9. Solution:

Let, a = 0.2101 and,

b = 0.2222...

We observe that in the second decimal place a has digit 1 and b has digit 2, therefore a < b in the third decimal place a has digit 0.

So, if we consider irrational numbers

x = 0.211011001100011....

We find that a < x < b

Hence x is required irrational number.

10. Solution:

Let,

a = 0.3010010001 and,

b = 0.3030030003...

We observe that in the third decimal place a has digit 1 and b has digit 3, therefore a < b in the third decimal place a has digit 1. So, if we consider rational and irrational numbers

x = 0.302

y = 0.302002000200002.....

We find that a < x < b and, a < y < b.

Hence, x and y are required rational and irrational numbers respectively.

11. Solution:

Let a = 0.5 = 0.50 and b = 0.55

We observe that in the second decimal place a has digit 0 and b has digit

5, therefore a < 0 so, if we consider irrational numbers

x = 0.51051005100051...

y = 0.530535305353530...

We find that a < x < y < b

Hence x and y are required irrational numbers.

12. Solution:

Let a = 0.1 = 0.10

And b = 0.12

We observe that In the second decimal place a has digit 0 and b has digit 2.

Therefore, a < b.

So, if we consider irrational numbers

x = 0.1101101100011... y = 0.111011110111110... We find that a < x < y < 0

Hence, x and y are required irrational numbers.

13. Solution:

If possible, let $\sqrt{3} + \sqrt{5}$ be a rational number equal to x.

Then,

$$x = \sqrt{3} + \sqrt{5}$$

$$x^2 = \left(\sqrt{3} + \sqrt{5}\right)^2$$

$$x^2 = 8 + 2\sqrt{15}$$

$$\frac{x^2 - 8}{2} = \sqrt{15}$$

Now, $\sqrt{\frac{x^2 - 8}{2}}$ is rational

$\sqrt{15}$ is rational

Thus, we arrive at a contradiction.

Hence, √3 + √5 is an irrational number.